

USING SAS® GRAPHICS TO EXPLORE EMPLOYER PREFERENCE WHEN HIRING NEW GRADUATES

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One of the fundamental goals of universities is to prepare students for the workforce. Consequently, matching university curriculum with industry's requirement is crucial. This is to ensure that new graduates are well-equipped with the necessary skills when they enter the job market. This paper presents the results of an exploratory study to evaluate employer preference for essential skills in jobs that require tertiary qualifications. The evaluation is accomplished by analyzing job descriptions extracted from job advertisements in online job portals. The analysis focuses on six categories of employability skills: communication, analytical, interpersonal, personal, information management and technical skills. In this paper, analysis on selected characteristics are presented and discussed. The analyses are carried out using SAS/STAT and the results are presented using graphics provided by SAS/GRAPH and SAS/IML. Among the tools used are correspondence plot, mosaic diagrams and fourfold display. The results show that there are indications of differences in employability skill requirement between different categories of jobs. The findings of this study can be used as a basis for determining skills required for jobs by areas of specialization. This would be useful when formulating and carrying out workforce development programs to create a skilled and knowledgeable workforce.

Keywords: Employability skills, SAS/GRAPH, SAS/STAT, SAS/IML, mosaic diagram, fourfold display

1. Introduction

One of the fundamental goals of institutions of higher learning (IHL) is to prepare students for the workforce. Therefore, understanding the job competencies required by employers is crucial in matching university curriculum with industry's requirement. This is to ensure that new graduates are well-equipped with the necessary skills when entering the job market, thereby reducing the need for initial on-the-job training. However, preparing graduates who meet with the skill requirement of an increasingly competitive, knowledge-based global economy is a big to IHL worldwide. On the part of the students, they have to prepare themselves to meet the requirement of potential employers and know what to expect when they enter the job market. With that in mind, this research explores the expectation and preference of employers when hiring new graduates based on jobs descriptions in advertisements for various types of jobs that require tertiary qualifications. This paper presents the initial results of a study based on the analysis of selected preferences.

Research on employability of graduates usually focuses on six categories of employability skills: communication, analytical, interpersonal, personal, information management and technical skills. The focus of this paper is on language preference and transportation ownership requirement. Analysis for other skills and requirements require more data.

2. Literature Review

Several studies have focused on the transition of graduates from university to the workplace, the characteristics desired of university graduates entering the job market, and the possibilities of establishing partnership between universities and the business sector (Sinclair, 1997). A number of assessment instruments have also been developed to measure the employability skills of graduating students (Curtis, 2003) prior to joining the workforce. One such instrument is the Graduate Skills Assessment (GSA), which measures competency levels in problem-solving, critical thinking and reasoning, and interpersonal understanding (Australian Council for Educational Research, 2001).

Some studies focus on specific aspects of employability. Hill and Petty (1995), for example, conducted a study to identify constructs that characterize occupational work ethics and provide guidelines for the development of instructional materials and activities to enhance employability skills related to work ethics. Ugbah (1992) studied the underlying factor structure of communication behaviors in job interviews, and the effects of interviewer gender and age. The results revealed six dimensions of influential communication factors in job interviews.

Other studies focused existing gap in skills between that needed by a job and that possessed by applicants. Leveson (2000) concluded that language issues together with distinct differences between education and work cultures contribute to a disparity between educational objectives on the one hand and employer expectations on the other. Wu (2005) reviewed the development of effective learning systems and examined the relationship between employability and effective learning systems from the perception of the students. Other recent studies related to employment are those by Richardson and Karbanoff (2003), Cole et al. (2004) and Holden and Hamblett (2007), and Wilton (2007).

3. Methodology

Source of Data

Data for this study were obtained from job advertisements placed on jobstreet.com, a job search site available in nine Asian countries, namely, Malaysia, Singapore, Philippines, Hong Kong, India, Bangladesh, Japan and Vietnam. The analysis presented in this paper is based on job vacancies in Malaysia for fresh graduates with at least a certificate in any area of studies. During the period under study, there were more than two thousand new positions advertised that met the criteria for the analysis.

Employers' Preference

Employers' preferences are manifest in the respective skills stated in job advertisements. Since all of the variables are measured as categories, analysis is based on contingency tables. The study compares the employability skills desired by employers of four major categories of jobs: Engineering, Business, Computer Science and Others. Visualization of the patterns of relationships using appropriate graphics provides a better understanding of the relationships between variables prior to model building.

The graphics used as visualization tools are correspondence, mosaic and fourfold display. A mosaic display presents the frequencies for n-way contingency tables by a collection of rectangular tiles. The size or area of each tile is proportional to the respective cell frequency. The mosaic display also shows the residuals from a given log-linear model that has been fit to the data. The fourfold display is suitable for a 2 x 2 table to depict the sample odds ratio.

The above analysis presented in displays is obtained using SAS PROC CORRESP and PROC IML, respectively. The CORRESP procedure performs correspondence analysis to find a

graphical representation of the rows and columns of a contingency table. The procedure can also compute coordinates for supplementary rows and columns. The MOSAIC.sas is a collection of SAS/IML programmes and macros for producing mosaic displays for n-way contingency table of any size (Friendly, 2000).

In addition, odds and odds ratios are also produced for 2 x 2 tables to measure employment likelihood. Odds are measured by the ratio of the proportion of an event of interest (such as proficiency in English is required) and the proportion of non-event (English language requirement is not required). Odds value greater than one indicates that event of interest is more likely to occur than non-event. The odds ratio is the ratio of two odds. This value is useful when comparing the likelihood that an event is occurring in one group more than in another. For example, we may be interested to know how much more likely that an English language requirement is emphasized in business-related jobs than in engineering-related jobs. Knowledge on these requirements is important in designing appropriate curriculums for individual academic programs.

4. Discussions Of Results

Relationship Between Category of Jobs

Engineering jobs (30.6%) account for the largest proportion of the advertisements, followed by those for business graduates (23.3%) and computer science graduates (14.8%) (Figure1). However, the results also show that the job market is seeking entry-point employees who can adapt to various job environments and responsibilities. This is evident from the relatively high proportion (20.9%) of jobs open to fresh graduate from any discipline to apply. This contention is also evident from Figure 2, which is derived from correspondence analysis based on four categories of jobs (engineering, business, computer science and others). It shows that a particular job is not only open to graduates from a specific area, but to graduates from other areas as well based on the second area of study listed in the advertisement. In particular, companies looking for engineering graduates also invited graduates from computer science (CS2) and others (Others2) such as mathematics and pure science to apply. It is noted that computer science jobs are likely to be open to engineering graduates as well (Engn2). For business-related jobs, such as those in marketing and management, a much smaller proportion is open to science and technology graduates.

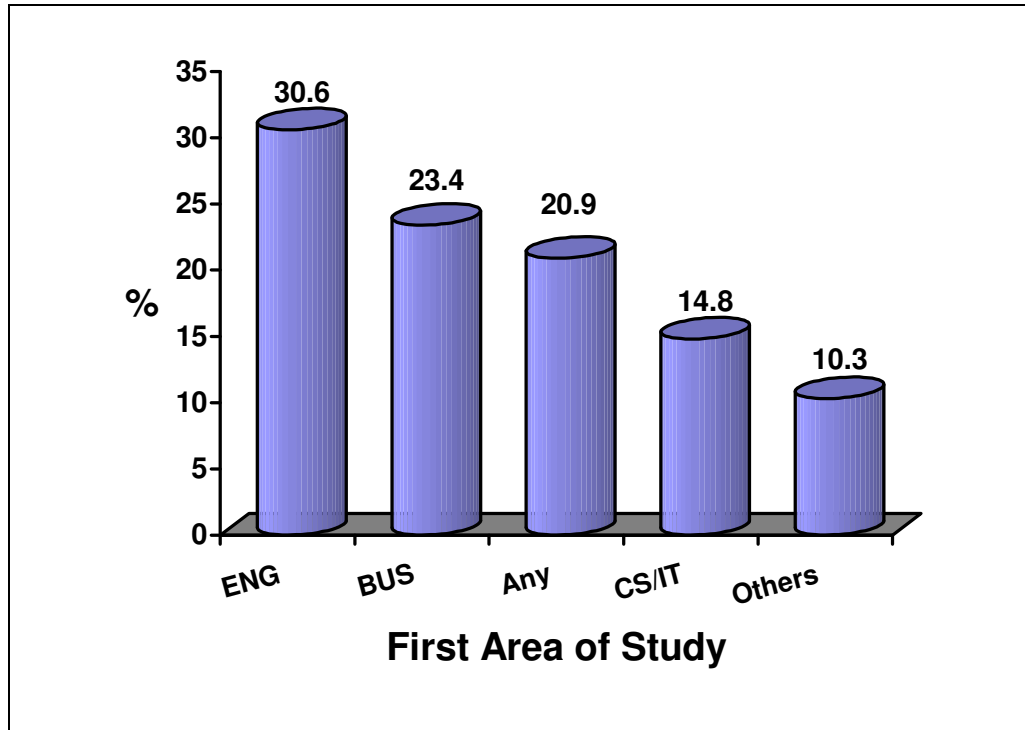


Figure 1: Distribution of job advertisements by area of study

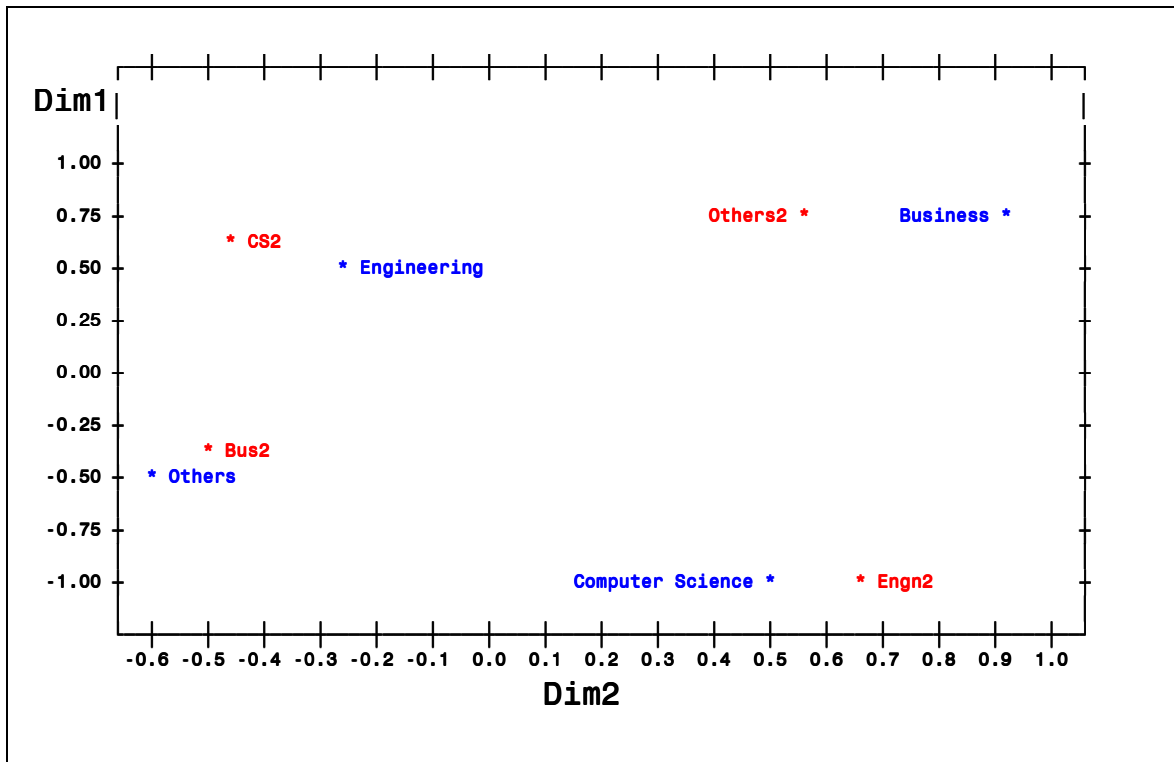


Figure 2: Correspondence analysis between first and second areas of study

Language and Other Preferences

Comparison of language preferences is based on the first language stated in the respective advertisement. Differences in language competencies by job category desired by employers can be visualized from Figure 3 as indicated by the different shades of the colored tiles. It shows that there is an indication of differences in emphasis on language requirement between the four categories of jobs. Jobs in the field of business tend to place higher emphasis on the ability to speak Mandarin *vis-à-vis* Bahasa Melayu and English, while engineering jobs and jobs under “others” emphasize more on English competency than other languages. For computer science jobs, more advertisements require Bahasa Melayu as the first language than English or Mandarin.

Similar mosaic displays can also be used to visualize the relationship between job category and requirement on transportation ownership and IT competency. Figure 3 indicates that business jobs are more likely to require applicants to have their own transportation, whereas there is no preference for transportation ownership in engineering and computer science jobs.

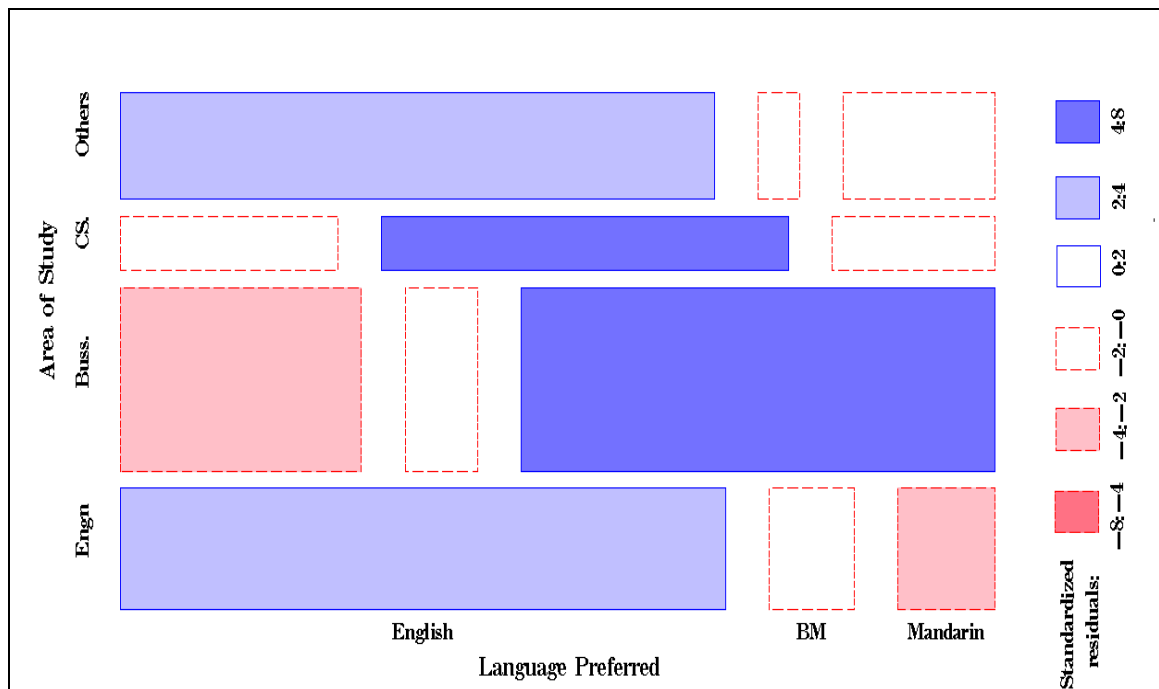


Figure 3: Mosaic display of language preference by category of job

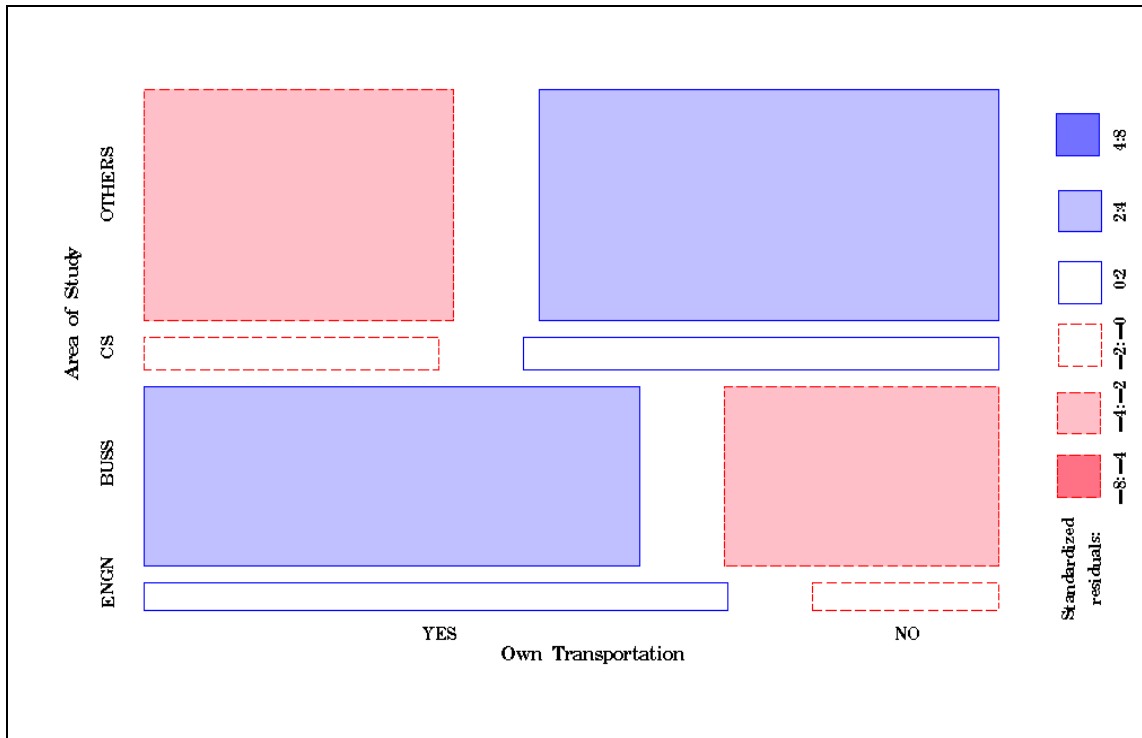


Figure 4: Mosaic display of transportation ownership requirement by category of job

For the purpose of exploring further differences and/or similarities between job categories, odds and odds ratios for language proficiency and other requirements are compared. The odds in Table 1 shows that overall, job advertisements for graduates are twice (1.82) more likely to specify English as the required language. The likelihood that English competency required is highest for business graduates (2.50), followed by graduates from other areas of study, except for computer science. Slightly less than half of job advertisements in computer science does not specify English competency requirement as reflected by the odds of just under one (0.96). However, for computer science jobs, the odds for Mandarin or Chinese dialects (0.72) is the highest compared with the other categories (0.65 and 0.58, for computer science and others, respectively).

Table 1: Relative Importance of Language and Own Transportation Requirements

Job Category	Language			Own Transport
	English	BM	Mandarin	
Engineering	1.82	0.62	0.32	0.22
Business	2.50	0.79	0.72	0.15
Computer Science	0.96	0.29	0.65	0.13
Others	2.03	0.72	0.58	0.19
Overall	1.82	0.62	0.51	0.18

The odds ratios in Table 2 indicate that jobs for business graduates are more likely to emphasize on language competency compared with other job categories. In particular, business

category jobs are 2.6 times more likely to require English compared with jobs in the computer science category, and are about twice more likely to require Mandarin compared with engineering jobs (2.20) and computer science jobs (1.8). The likelihood for Bahasa Melayu requirement is also relatively high especially compared with computer science jobs. In conclusion, language requirement differs slightly between categories of jobs, and that multi-lingual graduates are more likely to have better chances of securing jobs. Engineering jobs are also more likely to prefer those with own transportation as indicated by the odds ratios exceeding one. The highest ratios are for engineering against computer science (1.74) and computer science against others (1.50). However, these ratios are not significant.

The fourfold display in Figures 5 shows the relative preference for English between Business and Computer Science job categories, together with the confidence rings of the quadrants. Since the upper quadrants do not overlap with the lower ones, it means that the odds ratio differ significantly from 1. Similar conclusions can also be drawn from Figure 6 for the odds ratio for Mandarin preference between Business and Engineering jobs.

Table 2: Odds ratios for language requirement between categories

Category	Relative To	Language			Own Transport
		English	BM	Mandarin	
Engineering	Business	0.73	0.78	0.46*	1.47
	Comp. Science	1.89	2.11	0.85	1.74
	Others	0.90	0.85	0.50	1.16
Business	Engineering	1.37	1.27	2.20*	0.68
	Comp. Science	2.60*	2.69*	1.81	1.18
	Others	1.23	1.09	1.09	0.79
Comp. Science	Engineering	0.53	0.47	1.17	0.57
	Business	0.39*	0.37	0.55	0.85
	Others	0.48	0.40	0.60	0.67
Others	Engineering	1.11	1.17	2.02	0.86
	Business	0.81	0.92	0.92	1.27
	Comp. Science	2.10	2.47*	1.66	1.50

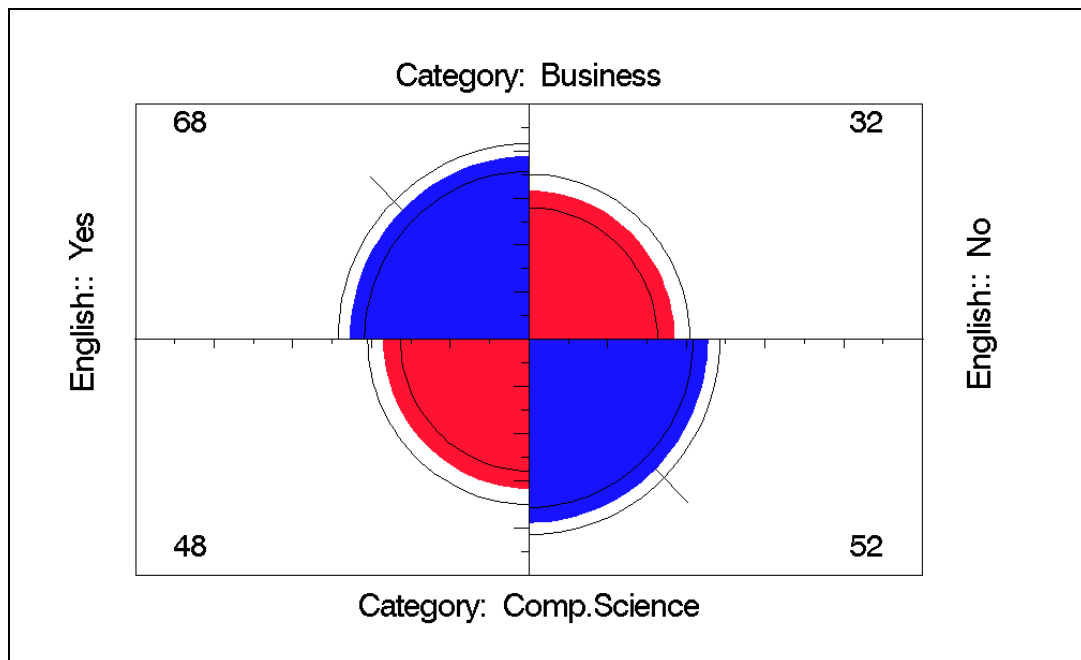


Figure 5: Comparison of English competency between business and computer science

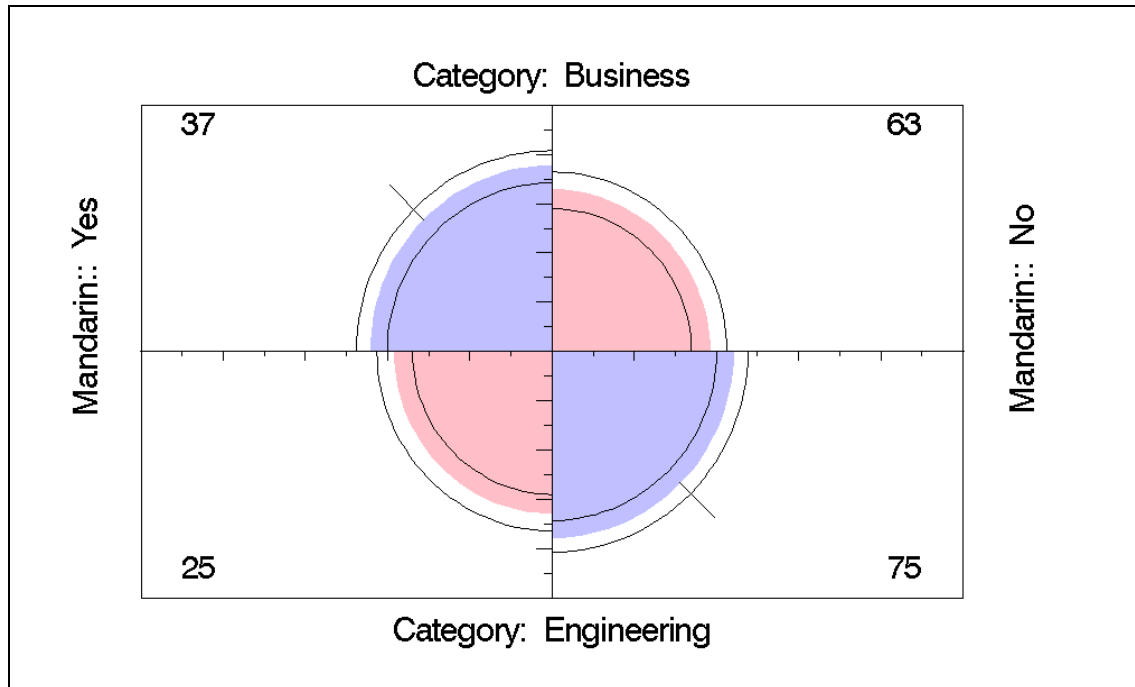


Figure 6: Comparison of Mandarin competency between business and Engineering

5. Conclusion

Graphical analyses presented in this paper indicate that language preferences and preference for owning transportation for specific categories of jobs do exist. However, the research is still at the preliminary stage. More data is needed to explain similarities and differences in preferences for other competencies or skills expressed by employers in job advertisements. Also, it is not known whether these preferences are manifest during actual hiring. Further analysis is needed to identify the determinants of these phenomena and their effects on the chances of fresh graduates securing jobs and their readiness for the jobs.

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